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under consideration, that is, we shall have the same velocity parallel to the plane, and the same angular velocity as if the sphere were in contact *with* the plane, because there is no slipping at the instance of contact.

Let v_1=velocity parallel to the plane. Then $\frac{v_1}{R}$=new angular velocity $=\omega_1$.

$$E=\tfrac{1}{5}MR^2\omega^2.$$

$$\text{Energy of translation}=\tfrac{1}{2}Mv_1{}^2.$$

$$\text{New energy of rotation}=\tfrac{1}{5}MR^2\omega_1{}^2=\tfrac{1}{5}Mv_1{}^2.$$

$$\therefore\ \tfrac{1}{5}MR^2\omega^2=\tfrac{1}{2}Mv_1{}^2+\tfrac{1}{5}Mv_1{}^2.\quad \text{Whence,}$$

$$v_1{}^2=\tfrac{2}{7}R^2\omega^2.$$

$$\therefore\ v_1=\sqrt{\tfrac{2}{7}}R\omega,\ \text{and}$$

$$\omega_1=\sqrt{\tfrac{2}{7}}\omega.$$

The distance which the sphere will move parallel to the plane while it is attaining its highest altitude will be $=tv_1=2\sqrt{\frac{a}{7g}}R\omega$.

From these data, knowing that the curve will be a parabola, we obtain

$$y^2=\frac{4R^2\omega^2}{7g}x,$$

the highest point in the origin. The distance between first and second impact is $4\sqrt{a/7g}\,R\omega$. As to the subsequent motion, we have the equation of energy

$$\tfrac{1}{2}Mv_1{}^2+\tfrac{1}{5}Mv_1{}^2=\tfrac{1}{2}Mv_2{}^2+\tfrac{1}{5}Mv_2{}^2,\ \text{or}\ v_2=v$$

and the subsequent parabola will be the same as the first.

PROBLEMS.

37. Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics and Astronomy, New Windsor College, New Windsor, Maryland.

A thin board of which the elements are given is balanced at the center but inclined at an angle. A sphere of known dimensions is put directly above the point of suspension and liberated. Find the motion of the system. That is, find (a) the time until the sphere leaves the board, (b) the ultimate angular velocity of the board.

38. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics, Drury College, Springfield, Missouri.

A prolate spheriod of revolution is fixed at its focus; a blow is given it at the extremity of the axis minor in a line tangent to the direction perpendicular to the axis major. Find the axis about which the body begins to rotate. [From *Loudon's Rigid Dynamics.*]